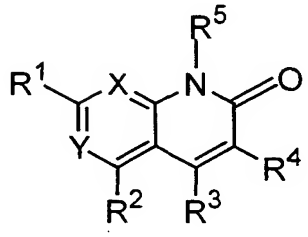
CLAIMS

1. A pyridopyrimidine or a naphthyridine derivative of the formula (I):



(I)

wherein R^1 is an optionally substituted nitrogen-containing heterocyclic group, an optionally substituted amino group or an optionally substituted alkoxy group;

R^2 is a hydrogen atom or a lower alkyl group;

R^3 is a hydrogen atom, an optionally substituted lower alkyl group or an optionally substituted heteroaryl group;

R^4 is a hydrogen atom, a lower alkyl group, or an optionally esterified or amidated carboxyl group;

R^5 is a lower alkyl group which may be optionally substituted by a group selected from an optionally substituted aryl group, an optionally substituted heteroaryl group and a di-lower alkylamino group; and

one of X and Y is a group of the formula: =CH– and the other is nitrogen atom, or X and Y are both nitrogen atoms, or a pharmaceutically acceptable salt thereof.

2. The compound according to claim 1, wherein, in the definition for R^1, the substituent of the "optionally substituted nitrogen-containing heterocyclic group" is a lower alkyl group optionally substituted by a group selected from a hydroxy group, a halogen group and a lower alkoxy group; the substituent of the "optionally

substituted amino group" is group selected from a lower alkyl group optionally substituted by a heteroaryl group, a lower alkyl group optionally substituted by an aryl group, and a lower alkoxy group; and the substituent of the "optionally substituted lower alkoxy group" is (1) an aryl group optionally substituted by a group selected from a hydroxy group, a halogen atom and a lower alkoxy group; or (2) a lower alkyl group optionally substituted by a heteroaryl group which may be optionally substituted by a group selected from a hydroxy group, a halogen atom and a lower alkoxy group;

in the definition for R^3, the substituent of the "optionally substituted lower alkyl group" is a nitrogen-containing heterocyclic group; and the substituent of the "optionally substituted heteroaryl group" is a group selected from **a lower alkyl group**, a hydroxy group, a halogen atom and a lower alkoxy group;

in the definition for R^5, the substituent of the "optionally substituted aryl group" or the "optionally substituted heteroaryl group" is a group selected from a hydroxy group, a halogen atom and a lower alkoxy group; and

X and Y are both nitrogen atoms.

3. The compound according to claim 2, wherein

the nitrogen-containing heterocyclic group of the "optionally substituted nitrogen-containing heterocyclic group" for R^1 is a 5- or 6-membered nitrogen-containing heteromonocyclic group or a 8- to 10-membered nitrogen-containing heterobicyclic group;

in the definition of "optionally esterified or amidated carboxyl group" for R^4, the esterified carboxyl group is a

carboxyl group esterified with a lower alkyl group, and the amidated carboxyl group is a carboxyl group amidated with a lower alkyl-substituted amino group which may be optionally substituted by a hydroxy group or an optionally substituted 5- to 6-membered nitrogen-containing heteromonocyclic group or a carboxyl group amidated with a 5- to 6-membered nitrogen-containing heteromonocyclic group; and in the definition of "lower alkyl group which may be optionally substituted by a group selected from an optionally substituted aryl group, an optionally substituted heteroaryl group and a di-lower alkylamino group", for R^5, the aryl group is a phenyl group and the heteroaryl group is a pyridyl or pyrimidyl group.

4. The compound according to claim 3, wherein, in the definition of "lower alkyl group which may be optionally substituted by a group selected from an optionally substituted aryl group, an optionally substituted heteroaryl group and a di-lower alkylamino group" for R^5, the optionally substituted aryl group is a phenyl group optionally substituted by a group selected from a lower alkoxy group, a lower alkylenedioxy group and a halogen atom, and the optionally substituted heteroaryl group is a pyridyl or pyrimidyl group optionally substituted by a lower alkoxy group and/or a halogen atom.

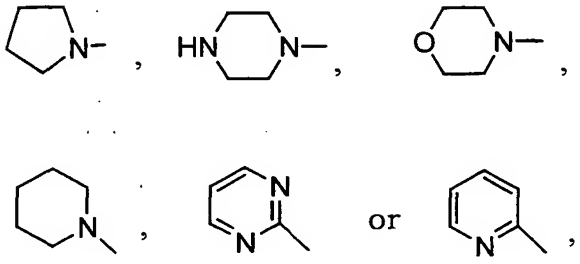
5. The compound according to claim 4, wherein the nitrogen-containing heterocyclic group of "optionally substituted nitrogen-containing heterocyclic group" for R^1 is a 5- to 6-membered nitrogen-containing heteromonocyclic group selected from pyrrolyl group, oxazolyl group, pyrazolyl group, pyrrolinyl group, pyrrolidinyl group,

imidazolyl group, piperidyl group, piperazinyl group, morpholinyl group, pyridyl group, pyridazinyl group, pyrimidinyl group, pyrazinyl group and triazinyl group or an 8- to 10-membered nitrogen-containing heterobicyclic group such as indolyl group, isoindolyl group, indolydinyl group, quinolyl group, isoquinolyl group and purinyl group; and

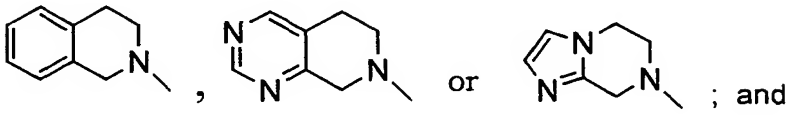
the amidated carboxyl group of the "optionally esterified or amidated carboxyl group" for R^4 is a carboxyl group amidated with a lower-alkyl-substituted amino group optionally substituted by a 5- to 6-membered nitrogen-containing heteromonocyclic group selected from pyrrolyl group, oxazolyl group, pyrazolyl group, pyrrolinyl group, pyrrolidinyl group, imidazolyl group, piperidyl group, piperazinyl group, morpholinyl group, pyridyl group, pyridazinyl group, pyrimidinyl group, pyrazinyl group, triazinyl group, imidazolidinyl group and thiazolyl group, each group being optionally substituted by a lower alkyl group, or a carboxyl group amidated with a 5- to 6-membered nitrogen-containing heteromonocyclic group selected from pyrrolyl group, oxazolyl group, pyrazolyl group, pyrrolinyl group, pyrrolidinyl group, imidazolyl group, piperidyl group, piperazinyl group, morpholinyl group, pyridyl group, pyridazinyl group, pyrimidinyl group, pyrazinyl group, triazinyl group, imidazolidinyl group and thiazolyl group, each group being optionally substituted by a lower alkyl group.

6. The compound according to claim 5, wherein the nitrogen-containing heterocyclic group of the "optionally substituted nitrogen-containing heterocyclic group" for R^1

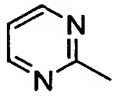
is a 5- or 6-membered nitrogen-containing heteromonocyclic group of the formula:



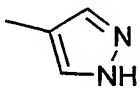
or a 8- to 10-membered nitrogen-containing heterobicyclic group of the formula:



the "optionally esterified or amidated carboxyl group" for R^4 is a carboxyl group amidated with a group selected from a lower alkyl-substituted amino group which may be optionally substituted by a group of the formula:

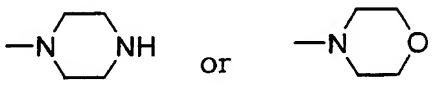


an amino group optionally substituted by a group of the formula:



which may be optionally substituted by a lower alkyl group, and

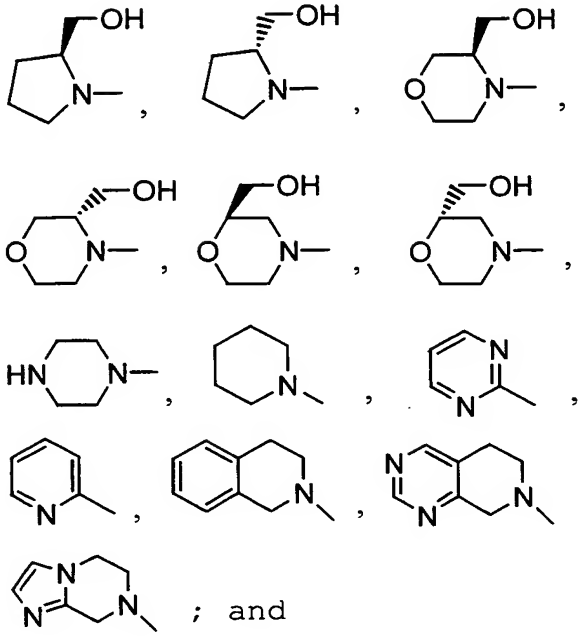
a group of the formula:



which may be optionally substitute by a lower alkyl group.

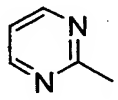
7. The compound according to claim 6, wherein the "optionally substituted nitrogen-containing heterocyclic

group" for R^1 is a group of the formula:

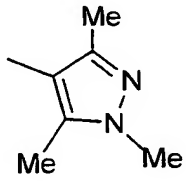


; and

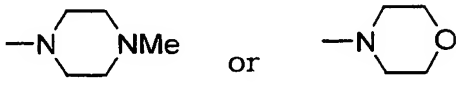
the "optionally esterified or amidated carboxyl group" for R^4 is a carboxyl group amidated with a group selected from a lower alkyl-substituted amino group optionally substituted by a group of the formula:



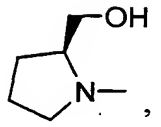
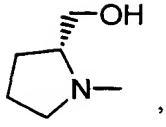
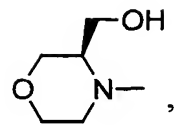
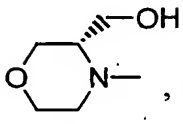
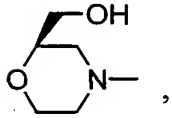
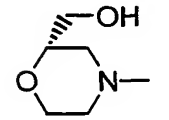
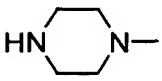
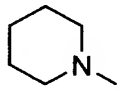
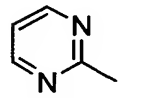
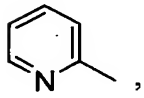
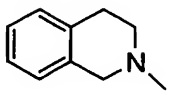
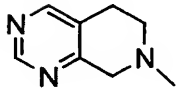
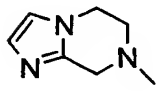
an amino group optionally substituted by a group of the formula:



and a group of the formula:



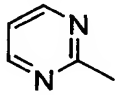
8. The compound according to claim 7, wherein R^1 is a group selected from the formulas:













and

;

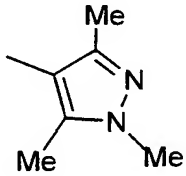
R^2 is a hydrogen atom;

R^3 is a hydrogen atom;

R^4 is a hydroxy group or a carboxyl group amidated with a lower alkyl-substituted amino group optionally substituted by a group of the formula:

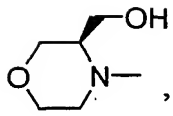
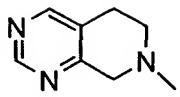
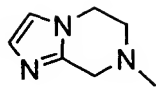

or

an amino group optionally substituted by a group of the formula:


, and

R^5 is a lower alkyl group substituted by a phenyl group optionally substituted by a lower alkoxy group and/or a halogen atom.

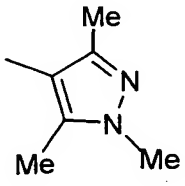
9. The compound according to claim 8, wherein R^1 is a group selected from the formulas:



and

,

R^2 is a hydrogen atom;

R^3 is a hydrogen atom;

R^4 is a carboxyl group amidated with an amino group optionally substituted by a group of the formula:


, and

R^5 is **a lower alkyl group substituted by** a phenyl group optionally substituted by a lower alkoxy group and/or a halogen atom.

10. (S)-2-(2-Hydroxymethyl-1-pyrrolidinyl)-5-[2-(4-morpholinyl)ethyl]-8-(3-chloro-4-methoxybenzyl)-7,8-dihydro-7-oxo-pyrido[2,3-d]pyrimidine;

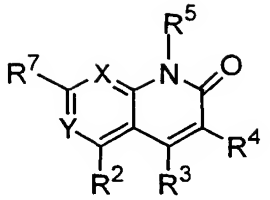
(S)-2-(2-hydroxymethyl-1-pyrrolidinyl)-6-[N-{4-(1,3,5-trimethyl)pyrazolyl}carbamoyl]-8-(3-chloro-4-methoxybenzyl)-7,8-dihydro-7-oxo-pyrido[2,3-d]pyrimidine;

(S)-2-(2-hydroxymethyl-1-pyrrolidinyl)-8-(3-chloro-4-methoxybenzyl)-7,8-dihydro-7-oxo-pyrido[2,3-d]pyrimidine;

(S)-2-(2-hydroxymethyl-1-pyrrolidinyl)-5-methyl-8-(3-chloro-4-methoxybenzyl)-7,8-dihydro-7-oxo-pyrido[2,3-d]pyrimidine, or a pharmaceutically acceptable salt thereof.

11. (S)-2-(2-Hydroxymethyl-1-pyrrolidinyl)-6-[N-{4-(1,3,5-trimethyl)pyrazolyl}carbamoyl]-8-(3-chloro-4-methoxybenzyl)-7,8-dihydro-7-oxo-pyrido[2,3-d]pyrimidine, or a pharmaceutically acceptable salt thereof.

12. A pyridopyrimidine or a naphthyridine derivative of the formula (VIII):



(VIII)

wherein R^7 is a halogen atom or a group of the formula:

$-SR^9$

wherein R^9 is an optionally substituted lower alkyl group or an optionally substituted aryl group;

R^2 is a hydrogen atom or a lower alkyl group;

R^3 is a hydrogen atom, an optionally substituted lower alkyl group or an optionally substituted heteroaryl group;

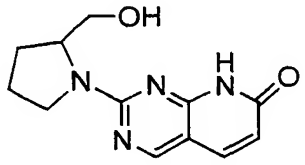
R^4 is a hydrogen atom, a lower alkyl group, or an optionally esterified or amidated carboxyl group;

R^5 is a lower alkyl group which may be optionally substituted by a group selected from an optionally substituted aryl group, an optionally substituted heteroaryl group and a di-lower alkylamino group; and

one of X and Y is a group of the formula: =CH— and the other is a nitrogen atom, or

X and Y are both nitrogen atoms, or a salt thereof.

13. A compound of the formula:



or a salt thereof.

14. A pharmaceutical composition, which contains as an active ingredient the compound as set forth in any one of claims 1-13, or a pharmaceutically acceptable salt

thereof.

15. A method for treatment of penile erectile dysfunction, which comprises administering an effective amount of the compound as set forth in any one of claims 1-13, or a pharmaceutically acceptable salt thereof, to a patient in need thereof.

16. A method for treatment of pulmonary hypertension, which comprises administering an effective amount of the compound as set forth in any one of claims 1-13, or a pharmaceutically acceptable salt thereof, to a patient in need thereof.

17. A method for treatment of diabetic gastroparesis, which comprises administering an effective amount of the compound as set forth in any one of claims 1-13, or a pharmaceutically acceptable salt thereof, to a patient in need thereof.

18. Use of the compound as set forth in any one of claims 1-13, or a pharmaceutically acceptable salt thereof, in the treatment of a patient with penile erectile dysfunction.

19. Use of the compound as set forth in any one of claims 1-13, or a pharmaceutically acceptable salt thereof, in the treatment of a patient with pulmonary hypertension.

20. Use of the compound as set forth in any one of claims 1-13, or a pharmaceutically acceptable salt thereof, in the treatment of a patient with diabetic gastroparesis.